3.0 Strategies to minimize electric service costs

Overview

This section describes strategies to minimize the cost of electric service to Washington consumers. For consistency, it groups these strategies into the same six categories as the trends in the preceding section:

1. **Wholesale market**
2. **Retail market**
3. **Supply adequacy and reliability**
4. **Environment**
5. **Technology**
6. **Fuel cost**

Many of the strategies available for minimizing electric service costs are not within the state's control. We include discussion of some strategies that may be outside of the state's purview in order to indicate where the most important decisions regarding future costs are likely to be made. Because the nature of the state's role and opportunities varies widely among the categories, the scope of strategies in each category also varies widely. As is the case throughout the report, we describe strategies and in some cases list arguments for and against them. However, no recommendations are implied.

Discussions of strategies also do not imply that any particular action is necessary. Some stakeholders feel that the best strategy for minimizing costs may be to minimize change. Others suggest that economic forces have already changed the electric power market in ways that make existing strategies for minimizing costs less appropriate. The tension between preserving the desirable characteristics of the existing system and responding to market changes that are already under way was a recurring theme in stakeholder comments on the draft report and in public meetings. Again, describing changes and outlining alternative responses implies no endorsement.

3.1 Wholesale market

For the most part, the wholesale electric power market is not under state jurisdiction. Wholesale power prices and wholesale transmission are generally regulated by the Federal Energy Regulatory Commission. However, the state may have a role in regional efforts to protect the benefits of the Federal Columbia River Power System (FCRPS) and in influencing policy development with respect to transmission grid operations.

3.1.1 Strategies to reinforce the connection between Washington consumers and the benefits of the Federal Columbia River Power System

Perhaps the single most important factor affecting the cost of electric service in Washington in the foreseeable future is the extent to which the benefits of the Federal Columbia River Power System remain with regional (primarily Washington) consumers. Retaining these benefits was the primary objective of the Comprehensive Review of the Regional Energy System. It is the main focus of the Governor's Transition Board. It is also the primary focus of efforts by members of the Northwest congressional delegation to craft a "Northwest Chapter" for federal electric restructuring legislation. The Bonneville Power Administration cited it as the overarching purpose of its December 1998 power subscription proposal. The value of these benefits depends on a variety of factors, most notably the future direction of prices in the wholesale power market. However, the Northwest Power Planning Council estimates that the 20-year value of these benefits exceeds $5 billion in all but the lowest market scenarios, and could exceed $20 billion in the highest market scenarios.[1]

Most of the strategies for retaining the benefits of the FCRPS proposed by the Comprehensive Review, the Transition Board, BPA, and others fall into three basic categories:

1. Paying for the system reliably;
2. Managing the system effectively and efficiently; and
3. Distributing the system's benefits equitably.

3.1.1.1 Paying for the system reliably:

If regional consumers fail to fully cover the costs of the FCRPS, federal taxpayers could be exposed to those costs. This could undermine the region's claim on the benefits of the system in the future. The Comprehensive Review and now BPA have proposed a system for "subscribing" to power from the FCRPS on terms that would maximize the likelihood that the costs of the system are fully covered by Northwest consumers. BPA and the Transition Board have recommended slightly different contingency plans for recovering costs from subscribers, should costs rise above those used to calculate rates. These contingency plans include: tapping a reserve fund for fish and wildlife recovery; a "cost recovery adjustment mechanism" that would raise power rates; additional cost reductions; and potentially a transmission surcharge to recover power costs. BPA has established a goal of reaching an 88% probability of making its annual payment to the U.S. Treasury on time and in full in every year of the five-year rate period beginning in 2001. High probability of Treasury repayment is widely regarded as an important index of the region's ability to pay for the FCRPS reliably.

A more direct strategy for covering the costs of the system would be for the region (probably meaning some combination of BPA's customers and the Northwest states) to purchase the FCRPS or its output. BPA customers have discussed this option. Members of Congress and representatives of federal executive agencies have also discussed this option as a way to reduce federal debt and reduce the presence of the federal government in power markets. We know of no active negotiations regarding purchase of the system.

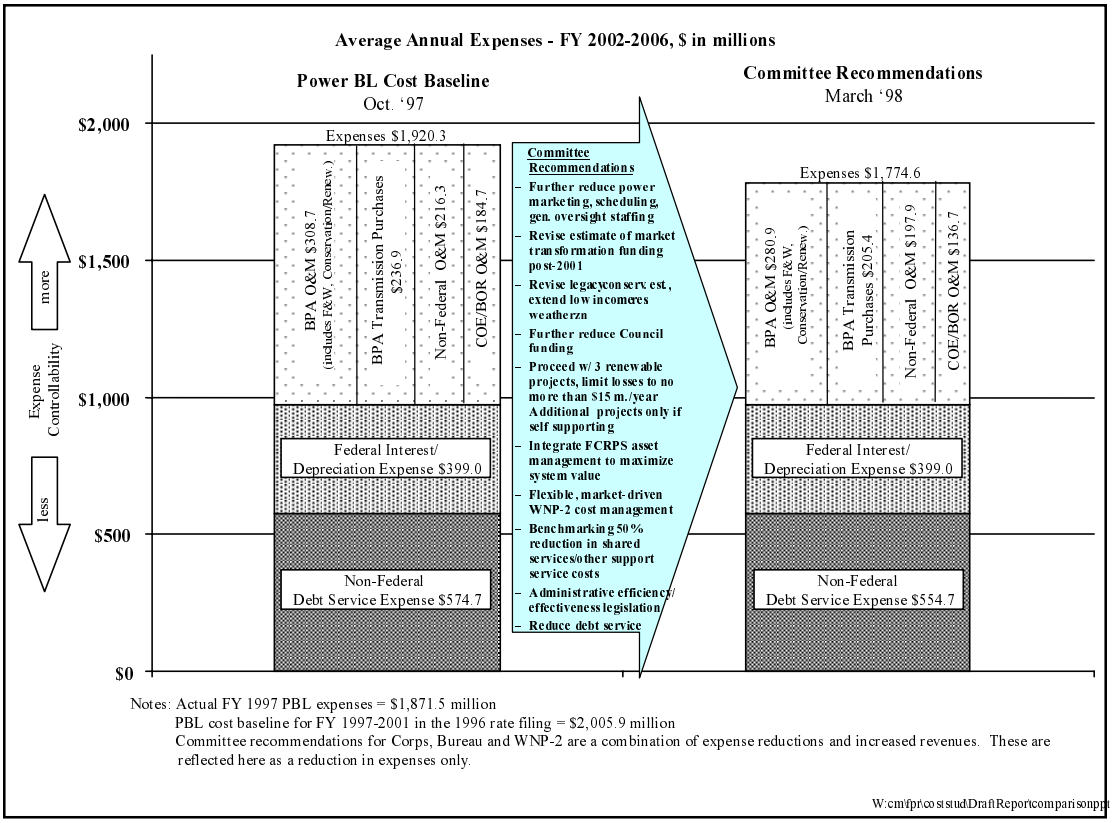
However, some BPA customers who have substantial generating capacity (the Public Generating Pool) have proposed that BPA offer a "Slice of the System" product for subscription. This product would consist of a proportion of the system's total output, rather than a fixed amount of power. Since the system's output is subject to substantial annual and seasonal fluctuation, the actual dimensions of the "slice" would vary. This would transfer some of the risks associated with precipitation and other variables from BPA to the customer. This transfer of risk is in some ways akin to ownership of a piece of the FCRPS. Insofar as this "slice" product increases the likelihood that regional consumers will bear the system's costs reliably, it may increase the likelihood that the system's benefits remain in the region. BPA proposes to offer the "slice" product in its upcoming subscription process.

3.1.1.2 Managing the system effectively and efficiently

The case for keeping the benefits of the FCRPS in the Northwest may be strengthened to the extent that the region can demonstrate that it is managing the system effectively and efficiently. Better management also increases the likelihood of paying for the system reliably. While effectiveness and efficiency are in the eye of the beholder, the following strategies for increasing the quality of FCRPS management are under consideration or being pursued:

- **Cost containment and production efficiencies:** In 1997, following the recommendations of the Comprehensive Review, the Northwest Power Planning Council established a cost control forum to assist BPA in controlling its costs. The recommendations of the cost management committee identify $146 million in reductions to planned power expenses for BPA's next rate period, Fiscal Years (FY) 2002-2006. These reductions are in addition to substantial cost cutting already undertaken. The effects of these recommendations on BPA's costs are depicted in the Figure below. The actual recommendations are included as Appendix 2-1. BPA plans to incorporate many of these recommendations in its upcoming rate proposal.

Figure 3.1 Cost review recommendations would reduce Power Business Line expense projections by about $146 million



- **End-use efficiency:** The case for keeping the benefits of the FCRPS may be stronger to the extent that the region maximizes the system's productivity by using system output efficiently. BPA has made substantial investments in energy efficiency over the years, saving roughly 690 average megawatts of power since 1982. However, due in part to competitive pressure at the wholesale level, BPA investments have been declining rapidly since 1994. As part of its package of recommendations, the Comprehensive Review suggested that states stem this decline by establishing a minimum investment standard in energy efficiency and renewable resources equivalent to 3% of total retail utility revenues. BPA proposes to provide rate discounts to its customers to support their energy efficiency investments and achievements. Other energy efficiency strategies are discussed in Section 9 of this report.
- **Improved environmental management:** The effectiveness of the region's efforts to restore endangered salmon and steelhead stocks may well affect the region's prospects for retaining the benefits of the system. Evaluation of alternative salmon recovery strategies in the Columbia Basin is well beyond the scope of this study. Landmark decisions with respect to recovery strategies for endangered Columbia River stocks are ex-

pected from the National Marine Fisheries Service in 1999. BPA has attempted to respond to the substantial uncertainty surrounding the costs of these strategies by adopting a set of "fish funding principles" and proposing to set power rates to accommodate a range of possible outcomes.

3.1.1.3 Distributing the system's benefits equitably

Members of the region's congressional delegation have frequently advised BPA customers and stakeholders to develop and support a regionally sanctioned way to share the benefits of the system or risk losing those benefits altogether. Some measure of regional agreement regarding the nature of BPA's role in competitive markets may also be an important component of a unified regional position.

The need to develop such a unified regional position was the impetus for undertaking the Comprehensive Review and for forming the Governors' Transition Board. It also underlies the attempts on the part of members of the congressional delegation to develop a "Northwest Chapter" for federal restructuring legislation. BPA's current subscription proposal[2] for sales of power starting in 2001 is an attempt to form the basis for such an agreement by accommodating the following claims on the system's benefits. (The following description outlines how BPA has attempted to structure a package that balances competing interests. No endorsement of any of these features is implied.):

- Public preference: The proposal allocates the substantial majority of the firm power from the FCRPS to public agencies.
- Extending the benefits to residential and small farm customers of investor-owned utilities: The proposal allocates 1800 aMW of power (and/or equivalent benefits in the form of cash payment) for residential and small farm customers of investor-owned utilities, with the prospect of more after 2006.
- Extending the benefits to Direct Service Industrial (DSI) customers: After meeting the requirements of its public and private utility customers, BPA expects to have enough power to meet the loads of the DSI customers.
- Preserving the Low Density Discount (LDD) and defraying transmission costs for remote systems: The LDD effectively allocates some of the benefits of the entire system to low-density rural systems, many of which are in Washington. BPA also proposes to absorb certain transmission costs for remote systems (the "General Transfer Agreements") in general power rates.
- Providing a discount for customers making qualifying investments in energy efficiency, renewable resource, and low-income weatherization.
- Adopting fish funding principles and rates that can accommodate a large range of costs associated with salmon and steelhead recovery.

- ❖ Offering a "slice of the system" product for customers with the ability and inclination to accept more of the risks and rewards of variations in system output and costs.

With respect to BPA's position in competitive markets, the subscription proposal may reduce BPA's role in acquiring new resources to serve customers, thereby lowering the agency's profile in generation markets. The Transition Board has issued a set of recommendations that would subject BPA's transmission rates and operations to oversight by the Federal Energy Regulatory Commission on terms comparable to FERC's regulation of private transmission carriers. The Comprehensive Review proposed limits on BPA's role in the energy efficiency marketplace by developing guidelines to prevent BPA from competing with private energy efficiency firms.

These efforts to reduce BPA's presence as a federal agency in the marketplace may reduce BPA's revenue-earning potential and/or conflict with BPA's existing statutory obligation to acquire resources to serve loads. However, they may also reduce the potential for conflict with private competitors and thereby promote the achievement of regional consensus on the future of the FCRPS and BPA. There may be an inherent tension between reducing BPA's competitive presence and ensuring that the agency earns sufficient revenue to cover its costs reliably while providing adequate supplies to serve regional customers.

3.1.2 Strategies to promote more effective wholesale competition through efficient, competitively neutral operation of the high-voltage transmission grid

Section 2 described changes in the regulation of the nation's high-voltage transmission system designed to promote an efficient wholesale generation market. FERC's Orders 888 and 889, issued in 1996 and revised in 1998, required jurisdictional (investor-owned) utilities to file "open access" tariffs, under which they are to treat competitors the same as they treat their own power marketing departments or subsidiaries. Order 888 also anticipated and encouraged the formation of regional Independent System Operators (ISOs) to enhance the development of competitive power markets.

During 1996 and 1997, a number of utilities held discussions about forming "IndeGO," an independent system operator for the Northwest. One of the purposes of the IndeGO proposal was to remove "pancaked" transmission rates — the practice of charging a customer the embedded cost rate each time a transaction crosses a utility intertie. This practice results from multiple ownership of the transmission grid. Computer modeling done by the IndeGO pricing work group suggests that doing away with transmission "pancakes" could save the region $8-16 million a year in fuel costs alone due to more efficient dispatch of existing resources. Savings have been estimated to be as high as $40 million if pancakes were eliminated throughout the western interconnection.

Additional savings may be reaped from more efficient system expansion decisions. Eliminating pancaked transmission rates might allow the Northwest to make larger seasonal purchases of energy from California, delaying the need to invest in new

capacity to meet winter peaks. Additional benefits cited by IndeGO supporters include: better reliability due to coordinated grid operation by an entity with a neutral position in the marketplace; reduced ability for large, transmission-owning utilities to exercise vertical market power; and more efficient use of the existing grid through transmission capacity rights that are easily tradable.

It is not clear, however, whether the benefits of forming an ISO outweigh the costs. Many stakeholders argue that the region already enjoys many of the benefits promised by an ISO due to the existence of the wide-reaching federal transmission network. Some IndeGO opponents argue that inefficiencies in the existing system are modest, so the potential for efficiency gains from independent system operation is small. Figure 3.2 displays detailed estimates of the costs and benefits developed for the IndeGO proposal. There is significant disagreement within the region about the magnitude of both the costs and the benefits displayed in this table.

Figure 3.2 Costs and Benefits of Forming IndeGO

Benefits

Estimated Annual Benefits from Forming IndeGO	***Value of Benefit to IndeGO Region***
Reduced Staffing	$14-18 million
Elimination of Multiple Control Centers	$2 million
Coordinated Main Grid Transmission Planning	$3-5 million
Eliminating Pancaking —Improved Generation Dispatch	$8-16 million
Eliminating Pancaking — More Efficient System Expansion [a]	$0-81 million
Total Quantitied Benefits	*$25-123 million*

Additional Benefits Claimed by Proponents

- More competitive power market — Less opportunity for "self-dealing" of transmission access or other ways to "game" bulk power markets
- More valuable use of existing facilities — tradable transmission rights increase chance of achieving "optimal" generation dispatch
- Improved reliability due to coordinated grid operation
- Improved dispatch due to better method of calculating losses

Costs

Startup Costs	
November, 1997 Estimate: Greenfield Facility	$89-164 million
February, 1998 Estimate: Dittmer Remodel [a]	$28 million
Operating Costs	
November, 1997 Estimate: 275 employees	$45 million
February, 1998 Estimate: 206 employees [a]	$24-32 million

Sources: IndeGO proposal, November 26, 1997; IndeGO Costs Paper, William Pascoe, February 26, 1998; IndeGO Benefits Report, IndeGO Benefit Analysis Work Group, September 2, 1998

Notes: [a] Estimates developed after the November proposal were not reviewed or endorsed by all IndeGO parties.

Additional concerns that parties in the region had about forming IndeGO include:

- The prospect of cost shifting among utilities and among states, as the IndeGO fixed cost recovery methodology would have resulted in some cost shifts.

- ❖ The ability and willingness of BPA to participate in an ISO;
- ❖ The potential transfer of jurisdiction over transmission rates from local boards and commissions to FERC; and
- ❖ Uncertainty about retail market structure in a number of states.

As a result of these concerns, the IndeGO proposal was shelved in the spring of 1998.

A number of utilities in the region are currently working on a more limited version of an ISO that they call an Independent Grid Scheduler (IGS). The IGS would take on a few of the functions envisioned for IndeGO, including calculating and posting ATC, hosting a short-term market for unused transmission capacity rights, and coordinating grid scheduling among existing control areas. The proposed entity would incur few of the estimated costs of a full-fledged ISO, but might also realize few of the estimated benefits. There is currently no timeline for IGS implementation.

FERC held hearings during the spring and summer of 1998 to examine whether and how it should require the formation of ISOs. Some FERC commissioners believe FERC already has the authority to order ISO formation.[3] FERC issued a Notice of Intent to Consult with states regarding ISO formation on November 24, 1998 (Docket RN99-2-000). This process will address such subjects as where the boundaries of these districts should be drawn, what the minimum functions of a regional transmission system operator should be, whether participation should be voluntary of mandatory, and what the role of states should be. It is unclear what meaning this would have for the Northwest, where more than three-fourths of the transmission is owned by BPA, which is currently subject only to limited FERC jurisdiction. It is also unclear how this would affect attempts to form an IGS.

3.2 Retail Market

3.2.1 Discussion of the relationship between retail restructuring and minimizing electric service costs

As noted in Section 2, most of the arguments about whether and to what extent retail restructuring will reduce electric service costs remain inconclusive. The record indicates that the Legislature's decision not to call for an explicit comparison of the effects of alternative retail market structures in ESSB 6560 was driven in part by a perception that such a comparison would be too speculative to be useful. Therefore, the agencies did not attempt to analyze the cost impacts of changes in retail market structure. Some of the arguments of proponents and opponents of retail restructuring are characterized briefly and crudely (though not analyzed or endorsed) below.

- ❖ **Arguments of proponents of retail restructuring**: Some proponents of retail restructuring maintain that retail choice is an effective strategy for minimizing electric service costs. They argue that the absence of competitive pressure allows regulated electric utility monopolies to build and earn profits on unnecessarily costly electric generation. Since conventional rate-of-return regulation links revenues to expenditures, regulated utilities generally earn more for spending more, to the extent that regula-

tors approve these costs. They argue that average rates set by regulators can provide incorrect price signals, causing customers to consume more power when they should use less and less when they should use more. Proponents also argue that, since customers have no option but to purchase from their monopoly provider, utilities can load excessive costs into rates with impunity, so long as regulators approve. While regulators are charged with minimizing costs to consumers, this regulatory control is pitted against a powerful incentive for investor-owned utilities to include more costs in rates, since they earn a return on most costs. Furthermore, proponents argue that the "natural monopoly" rationale for rate regulation no longer applies to electrical generation in the same way it applies to distribution or transmission. Some proponents of restructuring legislation argue that, without such legislation, competitive forces will tend to erode important collective investments that are currently carried in utility rates, including taxes, energy efficiency, renewable energy investments, and low-income services. Others suggest that restructuring may result in greater demand for power generated from renewable resources and thereby decrease environmental costs. Proponents of retail restructuring point to the experience in wholesale power markets and other services such as telecommunications as evidence that competition not only lowers costs but also enhances service by providing more product innovation and responsiveness to customers. Finally, some argue for restructuring on the grounds that retail competition is already occurring and that some legal framework for that competition is necessary.

- **Arguments of opponents of retail restructuring**: Some opponents of retail restructuring suggest that it will tend to level generation prices toward a system-wide average across the western power grid. Since Washington's prices are currently among the lowest, this will tend to shift costs in our direction. This is the conclusion of a number of studies of the effect of retail competition on prices. Opponents also argue that retail choice in some form already exists in Washington, insofar as consumers can choose to form public utilities. This choice, they contend, provides adequate competitive pressure on prices, while preserving local control that might be lost under retail restructuring. Some opponents of restructuring argue that the physical and operational characteristics of the power system lend themselves to vertical integration, and that restructuring may therefore cause cost increases and/or operational difficulties. Other opponents suggest that, since customers have dramatically different load characteristics and bargaining ability, competition will lead to cost shifting among customers rather than cost reductions. They suggest that marketing to small customers may be unprofitable and that these customers will not enjoy the benefits of competition. Some opponents suggest that unstructured competition leads to competitive pressures to reduce investments necessary to sustain reliability, customer service, and environmental protection. Opponents maintain that wholesale competition is already squeezing as much genuine efficiency as possible out of electric genera-

> tion, and that retail competition would bring no additional benefit. They, too, point to the experience in telecommunications as evidence: while long-distance rates are clearly lower, some contend that the cost savings are more than offset by greater confusion, intrusive marketing, and a proliferation of unwanted and expensive services.

We have no meaningful way of evaluating whether and to what extent retail choice will reduce total costs at this point. Data from other industries, countries, and states are sketchy. The data that do exist tend to focus on prices, with very little information on total costs of service. Even to the extent that these price trends are relevant, it is generally difficult to separate the relative impact of wholesale competition, technology changes, fuel cost fluctuations, and other factors from the impact of introducing retail competition. Also, Washington's unique mixes of federal, state, and local institutions and public and private power make it difficult to generalize from experiences elsewhere.

Retail competition may result in real increases in efficiency and reductions in cost. It may also result in increased product diversity and innovation. For some utility customers, the savings potential may be modest, particularly where existing rates are low. Other possible outcomes of retail competition include: redistribution of the costs and benefits of existing generating resources; shifting of tax burden; reduced investments in cost-effective conservation, renewable energy, low-income services, reliability, customer service, and other shared costs; and increased transaction costs.

These other possible outcomes generally do not represent reductions in the cost of energy service. Some of these outcomes may lead to lower prices for some consumers, but those price reductions may be accomplished by shifting costs or undermining investments necessary to minimize long-term costs and sustain a safe, reliable, environmentally sound system. These outcomes are not necessary products of retail competition or any particular market structure. They also do not reflect any unfair activity on the part of customers who take advantage of the opportunity for price reductions. Rather, these potential outcomes suggest that competitive pressures compel suppliers and price-sensitive consumers to seek competitive advantage wherever they can find it. These outcomes may frustrate the primary intent of competition: cost reductions generated by real efficiencies.

Again, we cannot conclude with confidence that any particular retail market structure will minimize costs, and ESSB 6560 did not call for such conclusions. However, regardless of future market structure decisions, competitive pressure exists and is likely to persist in the electric utility industry. The following three subsections describe strategies that may promote cost minimization in any market structure where competitive pressures exist by:

1. Reinforcing the connection between Washington consumers and existing low-priced resources.
2. Mitigating sources of competitive advantage that may either shift or increase total costs.

3. Removing market barriers and establishing or reinforcing the conditions for efficient market operation.

3.2.2 Strategies to minimize costs where competitive pressure exists by reinforcing the connection between Washington consumers and existing low-priced resources

With growing competition in wholesale and retail markets, the traditional connection between consumers and the electric resources built to serve them may be eroding[4]. The reasons for this trend are discussed in Section 2.

In much of the rest of the country, the most contentious issue in retail restructuring is: "Who will bear stranded costs?" In Washington, stranded costs are likely to be modest. In many instances, we may face the opposite issue. Insofar as electric generating resources used to serve Washington consumers are worth more than they cost, the animating issue here is how the positive difference between value and cost is distributed among Washington consumers, other consumers, and shareholders. This issue could be framed as "Who will reap the 'stranded benefits'?"[5] Stranded costs and stranded benefits are variations on the same issue: "When resources are sold at market, how is the difference between cost and market price distributed?"

This issue arises in conjunction with the transition to market prices. While Washington law does not mandate such a transition, data collected from utilities suggest that such a transition is at least partially under way in the retail market. (See 2.2.2.2) The transition is, of course, well under way in the wholesale market throughout the West. Corporate realignments and partnerships discussed in 2.2.2.9 also suggest that the traditional connection between consumers and the electric power resources that serve them may be becoming more fluid.

Because this issue concerns the distribution of the costs and benefits of existing resources, it may be a cost-shifting issue. (See Section 4.) We discuss it briefly here because, from a Washington-only perspective, it may well affect total electric service costs. The biggest part of this issue concerns the connection between Washington consumers and the resources of the Federal Columbia River Power System. Strategies to reinforce that connection are discussed in 3.1.1. However, Washington consumers are also served by a variety of publicly owned and privately owned non-federal resources that may be worth more than they cost. Strategies to reinforce the connection between Washington consumers and the benefits of those resources are discussed in Section 4, Electricity Rates and Equity.

3.2.3 Strategies to reduce costs where competitive pressures exist by mitigating other sources of competitive advantage that may either shift or increase total costs.

The premise of the strategies below is that costs may be minimized where competitive advantage is gained only by achieving genuine efficiency and cost reduction. (Another source of competitive advantage that may be consistent with cost-minimization is product differentiation. However, since this section focuses on strategies to minimize costs, it does not discuss product differentiation.) While each of these

strategies is discussed more fully elsewhere in the report, they are listed here to indicate that they may reduce costs by focusing competitive pressure on the areas where it is most likely to result in real efficiencies.

3.2.3.1 Clarify and reinforce the distinction between components of electric service that are competitive and those that remain in monopoly service. Costs may be minimized where competition is focused on those portions of electric service that lend themselves to effective competition. (Power generation is generally acknowledged to be the component of service that is best suited to competition, though other functions including billing and metering may lend themselves to competition as well.) The purpose of competition may be frustrated, however, where competitive advantage can be gained by shifting or avoiding the costs of components of service that are not effectively competitive (such as local distribution). This suggests that cost-minimization may be more likely to occur where there is a clearly drawn line between the costs associated with competitive and monopoly components of service. Potential strategies for clarifying this line include:

- Encouraging or requiring separation of generation functions from transmission and/or distribution functions: Arguments for this approach suggest that competition will be enhanced and vertical market power will be reduced if the different components of electric service are provided by different businesses. Arguments against suggest that the physical characteristics of the electric system lend themselves to vertical integration and that efforts to "de-integrate" the industry raise property rights and local control concerns.
- Establishing geographically defined service territories for electric distribution: Proponents of this approach argue that it would both allow for equitable recovery of appropriate system costs and prevent construction of costly, duplicative, and poorly integrated distribution facilities. Opponents argue that eliminating the option of distribution bypass would allow distribution companies to arbitrarily load costs into rates for delivery service. They also argue that there may be simpler strategies such as exit fees to prevent cost shifting. This strategy is described in Section 4. The status of contractual service territory agreements is describe in Section 5.

3.2.3.2 Define appropriate system-wide costs and determine a fair way to collect them from all users without imposing competitive handicaps on any supplier: The "appropriate" level of such system-wide costs is open to debate. However, such costs may include:

- Unavoidable shared costs of the existing system that cannot be recovered in competitive power rates;
- Costs of investments that may be necessary to minimize long-term costs, preserve reliability, or protect the environment. Collecting the cost of such investments through non-bypassable distribution charges, as some states and utilities now do, reduces the likelihood that competitive advantage will be gained by bypassing these costs. This strategy is discussed more fully in Section 9.

- ❖ "Stranded" generation costs. Where price advantage is gained through redistribution of existing, unavoidable generation costs, no cost reduction has occurred. However, the method for recovering stranded costs can have important implications for total costs. Stranded cost recovery is most likely to support cost minimization where:
  - Recovery of sunk costs does not support or require continuing operation of uneconomic generation;
  - Owners of uneconomic generation have an incentive to mitigate stranded costs; and
  - Recovery procedures and formulas confer no undue competitive advantages on incumbent suppliers.

  Stranded cost recovery is discussed in Section 4.
- ❖ Utility taxes. Tax reforms such as shifting the Public Utility Excise Tax to a use tax may be designed such that suppliers do not gain competitive advantage or suffer competitive handicap based on differential exposure to taxes. (See Section 4. See also, "Briefing Paper on Tax Policy and Restructuring the Gas and Electricity Industries," Washington Department of Revenue, November 1998.)

3.2.4 Strategies to minimize costs where competitive pressures exist by removing market barriers and establishing the conditions for efficient market operation

To the extent that competition exists or is extended further into Washington's retail market, several strategies to provide the conditions for efficient market operation may be worthy of consideration, including:

3.2.4.1 Providing retail choice to those customers who are prepared and willing to accept and respond effectively to market risks: The Washington Legislature has debated various structural changes to the retail market in which some or all customers would gain direct access to the power market. Many utilities now offer some form of access to market-based rates for large customers. However, it is not clear which customers actually want direct access and are prepared to accept and respond to market risks and opportunities. For customers with the capacity to evaluate market risks, make informed choices from among a variety of suppliers, and adapt their purchasing to market volatility, genuine cost savings may be a real possibility. For customers who lack information, attract few alternative suppliers, and are unable to respond to risks and opportunities, genuine cost savings are less likely. Exposing consumers who do have these capacities to market opportunities and risks may help to increase the efficiency of the generation market (by increasing the number and diversity of buyers) and minimize the cost of responding to possible energy and capacity shortages. (See 2.3) Strategies for ensuring that consumers who choose alternatives to rate-regulated service bear the risks associated with such choices are discussed in Section 4 under "Terms and conditions for exit and reentry to average rates."

3.2.4.2 Strategies such as aggregation that allow small consumers to participate effectively in competitive markets. Experience from retail pilots in Washington and the early experience in states that have restructured suggests that effective markets do not evolve instantly or automatically to serve small customers. Public policies that facilitate aggregation of smaller loads into larger and more effective purchasing blocs may hasten the evolution of a more effective market for small consumers[6].

3.2.4.3 Information and disclosure: Markets function more effectively when consumers have accurate information. Lack of information may be a particularly troublesome obstacle for small consumers, since the cost of acquiring more information (measured in time and intrusiveness) may outweigh the benefits of informed shopping. However, to the extent that competitive options exist, public policies that increase the accessibility of accurate, objective, easy-to-understand and easy-to-compare information about those options are likely to promote cost minimization. Disclosure of information about generating resources is the subject of a study being delivered to the legislature pursuant to HB 2831.

3.2.4.4 Mitigating competitive advantages of "incumbent" suppliers. Where competition replaces monopoly service, a number of advantages may accrue to existing suppliers[7]. Insofar as these advantages do not reflect real efficiencies or cost savings offered by the incumbent, they may reduce the likelihood of cost reduction from competition. Where competition exists or is introduced, strategies to provide a level playing field for new entrants may help minimize costs.

3.3 Supply Adequacy and Reliability

Section 2.3 indicates that in some months, the region's demand for electricity could exceed the combined capacity of the region's power plants and the ability to import additional power. Without actions to prevent such shortfalls, the likelihood of deficits increases over time. The choice of strategies used to ensure adequacy and reliability of the region's power supply over time may have a significant impact on the cost of electric service.

Strategies to prevent such shortfalls include the variety of methods that utilities have used to meet growing demand in the past, including development of new generation resources, increasing transmission capacity, and demand-side measures including peak-shaving, distributed generation, and energy efficiency. However, as Sections 2.3 and 8.4.3 describe, implementation of these strategies is complicated by uncertainties regarding future market structure and the role of electric utilities with respect to meeting demand for power.

In the past, utilities could evaluate the range of supply and demand-side alternatives for providing adequate power supplies and capacity to serve a reasonably predictable customer base. However, with increasing competition in electricity markets and substantial uncertainty about the structure of those markets, utilities may be increasingly reluctant to assume full responsibility for meeting uncertain loads. (This trend is discussed more thoroughly in Section 2.3.) As a result, existing strategies for ensuring supply adequacy and reliability at the lowest cost appear to be less effective. New

strategies may have to consider not only the cost and feasibility of supply-side and demand-side alternatives, but also the financial, legal, and institutional arrangements that will allow for timely development of those alternatives.

The Northwest Power Planning Council launched a study to address the adequacy and reliability of the region's power supply in December of 1998. The Northwest Power Pool is also conducting a study on the adequacy of power supply for the current winter. The Power Council has convened an external advisory group to help with the study. Given time and resource constraints and the fact that other agencies are conducting a more thorough examination of the issue, the UTC and CTED did not undertake an independent review of strategies to ensure supply adequacy and reliability.

Section 8 of this report addresses the issue of resource adequacy from the perspective of electric system reliability. In 8.5.2, it briefly discusses two power supply-related strategies to improve reliability: mandated minimum levels of generation reserves and deployment of "distributed generation," such as fuel cells, microturbines, and solar photovoltaic systems. An alternative to mandated reserve levels would be to create a market where generators can bid in emergency capacity and end-users can bid in demand reductions. This may improve the incentive to maintain some emergency reserves while providing a means for ranking and choosing alternatives for preventing supply shortages according to cost.

Like many issues discussed in this report, the issue of resource supply adequacy and reliability reflects the transitional nature of this period in the electric industry. There appears to be no consensus as to the future structure of Washington's electric power market. Yet the effectiveness of mechanisms used in the existing structure to ensure adequate, reliable, least cost energy service may be waning. Under the 1980 Regional Act, the Bonneville Power Administration bears significant responsibility for developing new resources for the region, and the Northwest Power Planning Council prepares a resource plan to guide BPA in that effort. In the current environment, it appears unlikely that BPA will perform this function to any significant degree. As a result, the Power Council's Regional Plan may be of limited applicability to the region's actual resource development activities. In response, the Council has initiated a formal examination of what new mechanisms may be needed to achieve one of the Regional Act's statutory purposes, "to assure the Pacific Northwest of an adequate, efficient, economical, and reliable power supply."

3.4 Environment

The discussion of environmental trends in Section 2 suggests that three trends are most likely to have a significant effect on the environmental costs of electric service in the foreseeable future:

1. Declining populations and extinction of wild anadromous fish.
2. Global climate change.
3. Increasing competition in electric power markets.

The strategies described below for reducing environmental costs correspond to these same three trends.

3.4.1 Declining populations and extinction of wild anadromous fish

Alternative strategies for promoting recovery of declining salmon and steelhead stocks are the subject of intense debate in Washington and the region generally. The costs and benefits of these strategies are also the subjects of considerable controversy. It is well beyond the scope of this report to suggest which strategies are the most likely to minimize environmental costs or minimize the total cost of electric service. However, fisheries advocates, utilities, and other stakeholders appear to be converging on at least two broad objectives. These objectives are not, in themselves, strategies. However, they may serve as evaluation criteria for choosing among strategies in such a way as to minimize internal and external costs.

- **Coherence:** The proliferation of divergent, uncoordinated, and sometimes competing salmon recovery plans tends to increase internal costs and limit the overall effectiveness of recovery efforts. Currently, at least three "sovereigns" have their own recovery plans. The federal government has a recovery plan for some endangered and threatened stocks developed under the Endangered Species Act by the National Marine Fisheries Service. (A more comprehensive federal plan is due to be issued in 1999). The states have the Northwest Power Planning Council's Fish and Wildlife Program, in addition to a variety of individual state plans. The Columbia Basin tribes have an anadromous fish restoration plan called "Wy-Kan-Ush-Mi Wa-Kish-Wit (Spirit of the Salmon)." These plans contain contradictory provisions and reflect different strategies. Unification (or at least effective coordination) of these plans may enhance the prospects for reduction of both environmental and economic costs.
- **Accountability:** The recovery effort may cost less and produce more if it has a clearer focus on intended results and accountability for achievement of those results. Given the scientific uncertainty associated with salmon and steelhead recovery efforts, results cannot be guaranteed. However, fisheries advocates and other river interests appear to agree that expenditures to date have not produced satisfactory results. Most interests agree that a more focused, less fragmented strategy with a stronger link to the best available science would be more likely to produce results.

Accomplishing these objectives may or may not reduce the costs of anadromous fish decline that are internalized in power rates. That is, a coherent, results-oriented strategy may result in higher prices to electricity consumers, but this increase in internal costs may be outweighed by a decrease in external costs if the strategy is significantly more effective. Conversely, strategies that are designed to minimize the internal cost of fish recovery measures, such as administrative or legislated "fish cost caps", may lower prices but may also increase external costs by precluding implementation of effective recovery measures. Evaluation of the costs and benefits of any particular set of fish recovery measures or cost control methods is beyond the scope of this report.

3.4.2 Global climate change

Reducing environmental costs associated with global climate change is an international challenge. In the absence of national and international efforts to reduce greenhouse gas (GHG) emissions, Washington strategies would be fruitless; even eliminating all of Washington's GHG emissions would have little effect on global climate if the State was acting in isolation. However, actions to reduce GHG emissions may have other benefits.

Some actions to reduce greenhouse gases, such as cost-effective energy efficiency improvements, offer net economic benefits in addition to their environmental benefits. Also, Washington is home to a variety of industries that anticipate substantial growth due to growing demand for low-carbon and carbon-free energy sources. These industries include: fuel cell development, energy efficiency firms, silicon crystal manufacturing, power inverters, efficient equipment manufacturing, light vehicle technology, and others.

Because so much of Washington's existing electric power base is renewable, the State may gain economic advantage from some strategies to reduce carbon emissions. The price we pay for energy may fall relative to other states and countries if federal or international actions internalize the cost of GHG emissions. Washington may also stand to gain from strategies to reduce carbon emissions that allow for tradable credits for emission reduction. Efforts are underway in Congress to ensure that early actions to reduce GHG emissions receive credit in any future emission reduction or trading initiative[8].

Strategies for reducing the external costs of electric service by reducing greenhouse gas emissions or storing carbon may be grouped broadly as follows:

1. Identifying and evaluating greenhouse gas emission reduction options.
2. Increasing efficiency of electricity production and use and developing renewable energy resources.
3. Offsetting or sequestering emissions in other sectors.
4. Internalizing the cost of carbon dioxide and other greenhouse gases.

3.4.2.1 Identifying and evaluating greenhouse gas emission reduction options.

States can examine the range of alternatives for reducing emissions and/or establish emission reduction targets. Oregon, for example, has established a "benchmark" of returning to 1990 emission levels by 2000.[9] The state has identified a series of actions to help meet that benchmark.[10] Alternative methods of emission reduction could be ranked according to economic costs and benefits to help policy-makers determine which if any strategies are appropriate.

3.4.2.2 Increasing efficiency of electricity production and use and developing renewable energy resources.

Strategies to increase energy efficiency and develop renewable resources may help reduce greenhouse gas emissions without reducing energy service levels. Some of these strategies are discussed at greater length in Section 9 of this report.

3.4.2.3 Offsetting carbon dioxide emissions through non-power related strategies

- **Emissions offsets:** The electric system may look to other sectors of the economy for cost-effective alternatives to emission reduction at power plants. In Washington, the largest opportunities appear to lie in transportation. Emissions from transportation are obviously not costs of electric service, so mitigating them does not directly reduce the environmental costs of electric service. However, if emission reduction strategies include a market for carbon dioxide emissions reduction under a cap and trade system, mitigating emissions in other sectors may be a cost-effective compliance strategy.
- **Sequestration of carbon:** Sequestration is a strategy for storing carbon to prevent it from accumulating in the atmosphere. Carbon sequestration efforts include forest conservation management (controlling deforestation) and storage management (increasing carbon storage in existing forests or establishing new forests). Independent power producers are gaining experience with sequestration through international forest management initiatives. More advanced, experimental sequestration strategies are also being researched[11].

3.4.2.4 Internalizing the cost of carbon dioxide and other greenhouse gases.
The economic rationale for internalizing environmental costs generally is discussed below in 3.4.3. Given continuing international negotiations aimed at reducing these emissions, it seems unlikely that carbon dioxide costs will remain completely external to energy prices. Some modest costs for programs such as tree planting have already been internalized in power rates for some customers. Other possible forms of internalization include:

- Siting or other air quality standards for greenhouse gas emissions[12].
- Carbon taxes (to replace other taxes or to fund carbon reduction efforts)
- "Cap and trade" (setting an emission ceiling and establishing a system of tradable credits to achieve the desired reduction at minimum cost, as the Clean Air Act does for sulfur dioxide. See 3.4.3)[13]
- Carbon emission reduction or sequestration activities by power providers who recover the cost of those activities in power prices[14].

Actions that internalize GHG costs to power prices may cause concern among price-sensitive customers, particularly the electricity-intensive industries that locate in Washington because of lower power prices. However, internalization of GHG costs at the national or international level may increase the price of power in other regions relative to Washington, because Washington relies primarily on hydropower.

3.4.3 Aligning competitive markets and environmental objectives

As noted in Section 2.4, competition in electric power markets can affect both the total environmental cost of electric service and the distribution of environmental costs between internal costs (included in power rates) and external costs (not included in power rates).

Strategies for minimizing environmental costs in a competitive environment are included in the discussion above on global climate change and in Section 9. The restatement of these strategies below focuses on the characteristics of these strategies that lend themselves to application in a competitive environment:

3.4.3.1 Universal System Benefits Charge for investment in energy efficiency and renewable resources.

This strategy is discussed more fully in Section 9. It is designed to reduce the competitive handicap associated with investments that may minimize environmental costs and/or total costs, but not rates.

3.4.3.2 Internalize environmental costs

To the extent that we rely on markets to minimize costs, strategies to ensure efficient market operation may become more appropriate. Economists have identified "externalities" as a significant cause of inefficiencies in markets, including energy markets[15]. Market forces are more likely to minimize costs where costs are internal to price. Even where internalization reduces costs, however, it may cause concern among price-sensitive customers. Examples of internalization strategies that might be pursued at state, federal, or international levels include:

- Introducing environmental standards concurrently with competition: Environmental standards, such as emission reduction targets, can be used to ensure that competition to minimize price occurs within environmental limits deemed appropriate by the jurisdiction that adopts those limits.
- Pollution taxes: A direct way to internalize environmental costs is to apply a tax that approximates the cost of the environmental damage or the cost of mitigation measures. Such taxes can be used to fund mitigation. Alternatively, they can be made "revenue neutral" by using them to reduce or replace other taxes[16].
- Cap and trade: An alternative to directly adjusting price to reflect environmental costs (through, for example, carbon taxes) is to set an overall limit on the amount of a pollutant and allow a market to develop that minimizes the cost of achieving that limit. This mechanism allows emitters of the capped pollutant to purchase credits from other emitters who can reduce emissions more economically. An informal market of this type has already begun to develop among some U.S. utilities who have voluntarily agreed to greenhouse gas reduction targets[17]. This is how sulfur dioxide is regulated under the Clean Air Act, and how the United States proposes to reduce carbon emissions to meet the Kyoto protocol[18].

3.4.3.3 Avoid and/or eliminate incentives to continue operation of older, less efficient sources of generation.

Competition may provide an incentive for innovations that reduce the economic and environmental costs of electric generation. However, depending on how it is structured, competition may also prolong the operation of older, less efficient generating facilities. For example, if terms for stranded cost recovery support or require continued operation of high-cost generation, opportunities for economic and environmental

cost reductions may be missed. Strategies to avoid or compensate for these problems may include:

- Stranded cost recovery methodologies that do not require continued operation of facilities with high internal and/or external costs.
- Expedited siting for energy facilities that minimize environmental costs.

3.4.3.4 Facilitate development of markets for resources with low environmental costs.

The evolution of markets for "green power" could help to minimize environmental costs. Strategies to support evolution of such markets include:

- Direct access to resources with low environmental impacts: Even in the absence of a comprehensive retail access initiative, policy-makers could allow direct access to environmentally desirable alternatives[19]. It may, however, be difficult to sustain the administrative costs of providing access to "green" resources on such a limited basis.
- Disclosure of the environmental characteristics of electric generating resources and labeling of retail power products with environmental information: One of the requirements for efficient operation of competitive markets is clear, readily accessible information. Market research suggests that such information must be simple, objective, and somewhat standardized in order to be useful[20]. Disclosure and labeling of environmental information are discussed in Section 9 and at greater length by the UTC in its report prepared pursuant to HB 2831.
- Investing premium revenues associated with "green" resources toward development of additional "green" resources: "Green marketing" may reduce environmental costs if additional revenues from such marketing are invested in new resources with low environmental costs or in mitigation of environmental damage.

3.5 Technology

3.5.1 Background

Development and application of new technologies is generally a long-range, but nevertheless potentially important, strategy for reducing electric service costs. However, as discussed in 2.5, utility industry investments in electric technology R&D have declined dramatically in recent years, apparently due to short-term competitive pressures. As of 1994, U.S. utilities devoted about .03% of their revenues to R&D compared to an average of 3.1% for U.S. industrial firms[21]. We have no data on R&D trends for electricity-related industries other than utilities, such as equipment manufacturers. To mitigate competitive pressure to reduce R&D efforts, some states include R&D among the categories of investment that are supported by a system benefits charge.[22]

The private sector, USDOE, universities, national laboratories, and other research institutions are typically the leaders in energy technology research, development, demonstration, and commercialization. For example, the Federal government supports the introduction of new energy technologies by funding research at national laboratories and through the creation of many private/public partnerships to bring these new technologies to market.

The state can play a supporting role in technology development in a variety of ways. These roles can be loosely grouped into two categories: policy initiatives and partnerships. Policy initiatives may create a framework within which technology innovators have the necessary tools and incentives to conduct technology R&D. Partnerships may involve more active and ongoing participation by public agencies. These categories overlap substantially, since technology development often requires both policy support and collaboration among institutions with complementary capabilities.

3.5.2 Policy initiatives:

The discussion below focuses on some of the general strategies and institutional opportunities available for technology research, development, demonstration and commercialization rather than strategies to promote specific technologies.

- **Codes and standards**: Upgrade energy codes as cost-effective energy efficiency technologies become available. Technological innovation and expanding markets continue to drive down the cost of energy efficiency measures and products. Provisions for these new products could be incorporated in code as they become cost-effective during normal code review cycles. Washington can also support and participate in the development of federal appliance efficiency standards.
- **Market transformation and market development** initiatives to help commercialize new technologies: Market transformation is a relatively new approach to energy efficiency that concentrates on making structural changes to the markets for energy efficient goods and services. Market transformation frequently supports technological innovation[23]. It is discussed at greater length in Section 9. Market development strategies could include initiatives such as portfolio standards or public purchasing activities that expand the market for new technologies. (These are discussed in Section 9.) Alternatively, the state could target more conventional business development activities toward businesses engaged in energy technology development. Such strategies include: technical assistance, microloans, state administered federal grant and loan programs, retention and recruitment, business incubators, and trade assistance.
- **Increased linkages among energy services and information services**: The prospects for enhanced interaction between electricity technologies and information technologies appear to be growing. As new ventures linking these technologies are formed and the market develops, state policy-makers may wish to identify and/or remove barriers to cost-reducing integration of these technologies[24].

- **Public investment in technology research, development, demonstration and commercialization**: Technology research and development activities may exhibit the economic characteristics of "public goods:" since their benefits are shared widely, there may be inadequate incentives for any one party to bear the cost of producing those goods.[25] The combination of this public goods problem and growing short-term competitive pressures appear to have reduced R&D investment by utilities to a very low level. Alternative sources of public investment for such purposes are discussed in Section 9. At least seven states that have adopted system benefits charges direct or allow a portion of those revenues to be used for R&D.
- **Support for federal research and development**, particularly at NW institutions such as BPA, PNNL, and the state's research universities.

3.5.3 Partnerships

Washington State government has a long history of partnering with private and public sector entities for technology development. This history includes promotion of the state's leading technology industries and support of two premier research universities.

Washington firms and research institutions are already among the leaders in some of the most promising new electric power technologies being developed.[26] In addition to the many private firms in Washington with energy technology expertise, a variety of public institutions may bring valuable expertise to energy technology partnerships, including: the Bonneville Power Administration, Pacific Northwest National Laboratories, the US Department of Energy Regional Support Office, Washington State University Energy Program, the University of Washington, Spokane Intercollegiate Research and Technical Institute, the Washington Public Power Supply System, Conservation and Renewable Energy Systems, individual utilities, local governments, and others.[27] (PUD authorizing statues may limit their ability to enter into such partnerships.)

Energy technology partnerships with public and private institutions can take many forms. Existing partnerships include:

- A recently signed Memorandum of Understanding among the Washington Public Power Supply System, PNNL, and the WSU Energy Program to develop improved renewable and distributed energy technologies; and
- The Association of State Energy Research and Technology Transfer Institutions' effort to develop a "virtual lab" among the states.

Other possible examples include:

- Energy technology development enterprises may provide research funding to university faculty and staff using a wide array of contracting mechanisms and intellectual property rights allocations.
- Business incubators for energy technology industries.
- Application of distributed generation (photovoltaics, fuel cells, etc.) and other emerging technologies in public facilities to support development of

such technologies. Installation of solar-powered emergency telephones on bridges and freeways by the Department of Transportation is an example.

- Support for energy R&D by Washington state research institutions. This can be achieved by directly funding (from a systems benefit charge or other source) university-based energy R&D and/or clearly identifying research on energy technologies as part of the institutions' missions. This may also help attract federal and private support to R&D initiatives that address Washington needs and priorities.

3.5.4 Technology Assessment

Like all technology initiatives, energy technology R&D is by its nature a risky undertaking. Determination of which if any policy initiatives and/or partnerships would be beneficial to the state may require a thorough understanding of existing technology trends and initiatives and an assessment of the state's technology-related challenges and opportunities. Because of the vast scope of potential technology activities, the limited resources available, and the inherent risks, the choice of policy initiatives and/or partnerships should be a considered one. To inform such choices, the state may wish to consider periodic technology assessments to:

- Monitor progress of technology development and understand the trends that are likely to affect Washington's electricity system.
- Identify needs and circumstances that present specific, technology-related challenges and opportunities for the state's electric power system (for example, hydroelectric turbine modifications to promote juvenile salmon survival without increasing spill.)
- Identify private and public institutions in the state with complementary research and technology capabilities that could position the state to host federal R&D initiatives.
- Identify barriers to development and implementation of energy technologies that would be particularly beneficial to Washington.

3.6 Fuel Cost

Since Washington is not a significant fuel-producing state, most strategies for minimizing fuel costs per se are not applicable. Many of the other strategies discussed in this report may have the effect of reducing the state's exposure to fuel cost increases, including:

- Strategies to increase the efficiency of electric power generation.
- Strategies to increase the efficiency of electric power consumption.
- Strategies to maximize the thermal efficiency of gas consumption including cogeneration and replacing electric water and space heat with gas.
- Some of the strategies designed to reduce carbon emissions.
- Developing renewable energy resources.

- ❖ Strategies to accelerate the introduction of low-carbon or carbon free energy sources.

Strategies using market-based risk management techniques, such as hedging, options, and futures, may help suppliers and some consumers manage fuel cost uncertainties.

Endnotes for Section 3

[1]Northwest Power Planning Council, Analysis of the Bonneville Power Administration's Potential Future Costs and Revenues, June 5, 1998, http://www.nwppc.org/98_11.htm.

[2]Bonneville Power Administration, Power Subscription Strategy Proposal, December, 1998.

[3] The Federal Power Act of 1920, §824a delegates to the Secretary of Energy the authority "to divide the country into regional districts for the voluntary interconnection and coordination of facilities for the generation, transmission, and sale of electric energy"

[4] For example PacifiCorp is divesting its distribution assets in Montana. PacifiCorp argues that, once they have no distribution business in Montana, they should not be allowed to recover any stranded costs from Montana consumers, nor should Montana consumers be entitled to any of the "stranded benefits" associated with PacifiCorp's below-market resources. With retail competition and divestiture, they contend, the link between Montana customers and the generating resources built to serve them is severed.

[5] The term "stranded benefits" may be a misnomer, since the issue arises not because the benefits are stuck, but rather because they are potentially unlinked from the traditional beneficiaries. Nevertheless, it is frequently used because it mirrors "stranded costs."

[6] See for example, Larry Alexander, et. Al, "Feasibility of Small Customer Aggregation for the Delivery of Comprehensive Energy Services in a Competitive Utility Environment," Proceedings from the ACEEE Summer Study, Washington, D.C. 1998.

[7] These advantages may include: Greater name familiarity; historical role in the community; scale of operations which would be prohibitive to duplicate; and potential ability to offer own supply subsidiary preferential access to distribution facilities.

[8] Senate Bill 2617, "Credit for Voluntary Early Action", October 1998

[9] "Oregon Shines II: Updating Oregon's Strategic Plan, A Report to the People of Oregon From The Oregon Progress Board and The Governor's Oregon Shines Task Force," January 21, 1997

[10] Oregon Office of Energy, Report on Reducing Oregon's Greenhouse Gas Emissions, December 18, 1996. Available at http://www.cbs.state.or.us/external/ooe/resource/finalrpt.htm

[11] More sophisticated and expensive sequestration strategies include capturing and sequestering carbon dioxide after combustion and decarbonizing fuel before combustion. Storage of carbon dioxide is proposed in the ocean or geologic formations. These approaches are technically feasible but the costs and the long-term environmental effects are largely unknown. Decarbonization involves removing some or all of the carbon from a fossil fuel and storing the carbon as a solid. This strategy faces economic obstacles because it substantially reduces the energy content of fossil fuels. Both technologies are considered long-term options.

[12] See, for example, Oregon HB 3823.

[13] "Greenhouse Gas Emissions Trading - Improved Compliance at Reduced Cost," Center for Clean Air Policy, Washington D.C., July 1997.

[14] For example, 650 utilities have signed Climate Challenge Participation Accords with USDOE in which they agree to reduce or limit greenhouse gas emissions. See "Early Action and Global Climate Change: An Analysis of Early Action Crediting Proposals", Pew Center on Global Climate Change, October 1998.

[15] See, for example, Hohmeyer, O., Social Costs of Energy Consumption, Springer-Verlag, 1989.

[16] For a complete discussion of this approach, see Tax Shift, Northwest Environment Watch, April 1998.

[17] Arizona Public Service is meeting its "Climate Challenge" commitment in part by purchasing credits from Niagara Mohawk Power Corporation, which were available because NMPC had reduced emissions by more than the amount necessary to meet its emission reduction commitment. Under the agreement, APS and NMPC jointly fund a renewable energy project in Baja Sur, Mexico. Source: APS online at http://www.apsc.com/power/96annual/releases.asp

[18] "Greenhouse Gas Emissions Trading - Improved Compliance at Reduced Cost," Center for Clean Air Policy, Washington D.C., July 1997.

[19] The Comprehensive Review, for example, recommended that access to "green" resources be allowed first, prior to general retail access.

[20] See, for example, "Uniform Consumer Disclosure Standards for New England: Report and Recommendations to the New England Utility Regulatory Commissions," November 13, 1997, prepared by The New England Disclosure Project, A Project of the National Council on Competition and the Electric Industry.

[21] JJ Dooley, "Unintended Consequences: energy R&D in a deregulated energy market." Energy Policy, 26 (1998), 551.

[22] Five states specifically allocate some SBC funds to r&d for energy efficiency and/or renewables. Two others encouraged r&d investment, but didn't earmark funds for it.

[23] For example, the Northwest Energy Efficiency Alliance is currently funding a project that would modify the furnaces used for growing silicon crystals to improve their energy and water use efficiency. This could represent a significant technological improvement in the process used for manufacturing photovoltaic cells and computer chips.

[24] For discussions of integration of communication, information, and energy technology, see Steven. R. Rivkin, "Co-Evolution of Electricity and Telecom. The Electricity Journal 11 (May, 1998), 71-76 and Paul A Centolella, "Energy Services in the Information Age: The Convergence of Energy, Communications, and Information Technologies." Proceedings from the 1998 ACCEE Summer Study on Energy Efficiency in Buildings. Washington, DC, 1998. Pp. 8.13-8.24

[25]"Strategic Options for Public-Interest R&D." Carl Blumstein and Stephen Wiel. September 19. 1997

[26] "The Next Generation of Energy: The Renewable Energy and Energy Efficiency Industries in Washington State,"" ECONorthwest for Washington DCTED, August, 1998.

[27] Washington public institutions currently focused on applied research development and demonstration of energy efficiency, renewables, and distributed energy technologies include but are not limited to:

1) Washington State University Energy Program with a broad focus on industrial (especially industrial motors), commercial, residential, energy distribution, and renewable technologies;

2) Pacific Northwest National Laboratory with a focus on a variety of specific energy efficiency and distributed energy technologies;

3) Spokane Intercollegiate Research and Technology Institute linked with Avista Lab with a focus on fuel cells;

4) The Washington Public Power Supply System's Applied Process Engineering Lab;

5) BPA with a focus on fuel cells and hydroelectric technology.